# Illinois Department of Transportation

| | | | |
|---|---|---|---|
| To: | Jeffrey L. Keirn | Attn: Carrie Nelsen | |
| From: | Jack Elston | By: Michael Brand | MDB |
| Subject: | Pavement Design Approval | | |
| Date: | June 5, 2018 | | |

Route: FAI 57 (I-57)
Section: (X1-4)R-2;(28-5-1, 28-5)R-1
County: Williamson
Contract: 78363
Limits: Just South of Country Club Road overpass to just South of the Johnston City Interchange overpass

Route: FAI 57 (I-57)
Section: (28-5-2,-3,-4,-5)R-2;28-5(B-2)
County: Franklin
Contract: 78631
Limits: Middle Fork Big Muddy River bridge to just South of the County Club Road overpass

We have reviewed the pavement design for the above referenced projects which were most recently submitted on June 1, 2018. The scope of the projects is to widen and resurface I-57 from a 4-lane to a 6-lane cross-section by adding a lane in each direction on the median side.

The pavement design resulted in three pavement widening options: 14" Full-Depth HMA mechanistic design, 15.75" composite design, and 14.25" modified AASHTO design. The first cost analysis of those options resulted in the Full-Depth HMA mechanistic design being 0.45% less expensive ($1,096,410 vs. $1,101,396) than the next cheapest option and thus the preferred option.

The approved pavement design is as follows:

  14" Full-Depth HMA Widening w/HMA Shoulders
  10" Subbase Granular Material, Type A

If you have any questions, please contact Mike Brand at (217) 782-7651.

# Illinois Department of Transportation

## Memorandum

| | | |
|---|---|---|
| To: | Jack Elston | Attn: Mike Brand |
| From: | Carrie Nelsen | By: Charles Stein |
| Subject: | Pavement Design Request | |
| Date: | June 1, 2018 | |

Route: I-57 (FAI 57)
Section: (X1-4)R-2;(28-5-1,28-5)R-1/(28-5,-2,-3,-4,-5)R-2;28-5(B-2)
County: Williamson/Franklin
Contract: 78363/78631

Attached for approval is the pavement design for the addition of a lane on I-57 in Williamson and Franklin County. The first project, 78363, will begin just south of the Country Club Road overpass (approx. station 240+00) and extend southerly to just south of the Johnston City Interchange Overpass (approx. station 172+50). The second project, 78631, will begin at the Middle Fork Big Muddy River bridge (approx. station 46+00) and extend southerly to the Country Club Road overpass (approx. station 240+00). Contract 78363 was recently awarded a TIGER grant and is in the November 2018 letting. Contract 78631 is not currently scheduled for letting but is expected to be funded with the IL Competitive Freight Grant and let in 2019.

The lanes adjacent to the proposed lane have been rubblized and overlaid with HMA in 2010. An additional full-depth HMA lane is proposed to be constructed on the median side in both directions.

Mechanistic, modified AASHTO, and composite pavement designs were completed in accordance with Chapter 54. Since the new lane will be constructed on the median side, it is not expected to carry the same amount of heavy truck traffic that is typically designed for the far right lane. Therefore the traffic used for the pavement design was reduced in accordance with recommendations from BMPR. To reinforce this, the district will include signing in the plans limiting heavy truck traffic to the two right lanes.

A first cost analysis was completed on the three pavement designs. The mechanistic pavement design, full depth HMA 14.00 inches thick, was the lowest cost by a very slight margin. The district proposes to use the mechanistic pavement design since it matches the adjacent add lane contract, 78184.

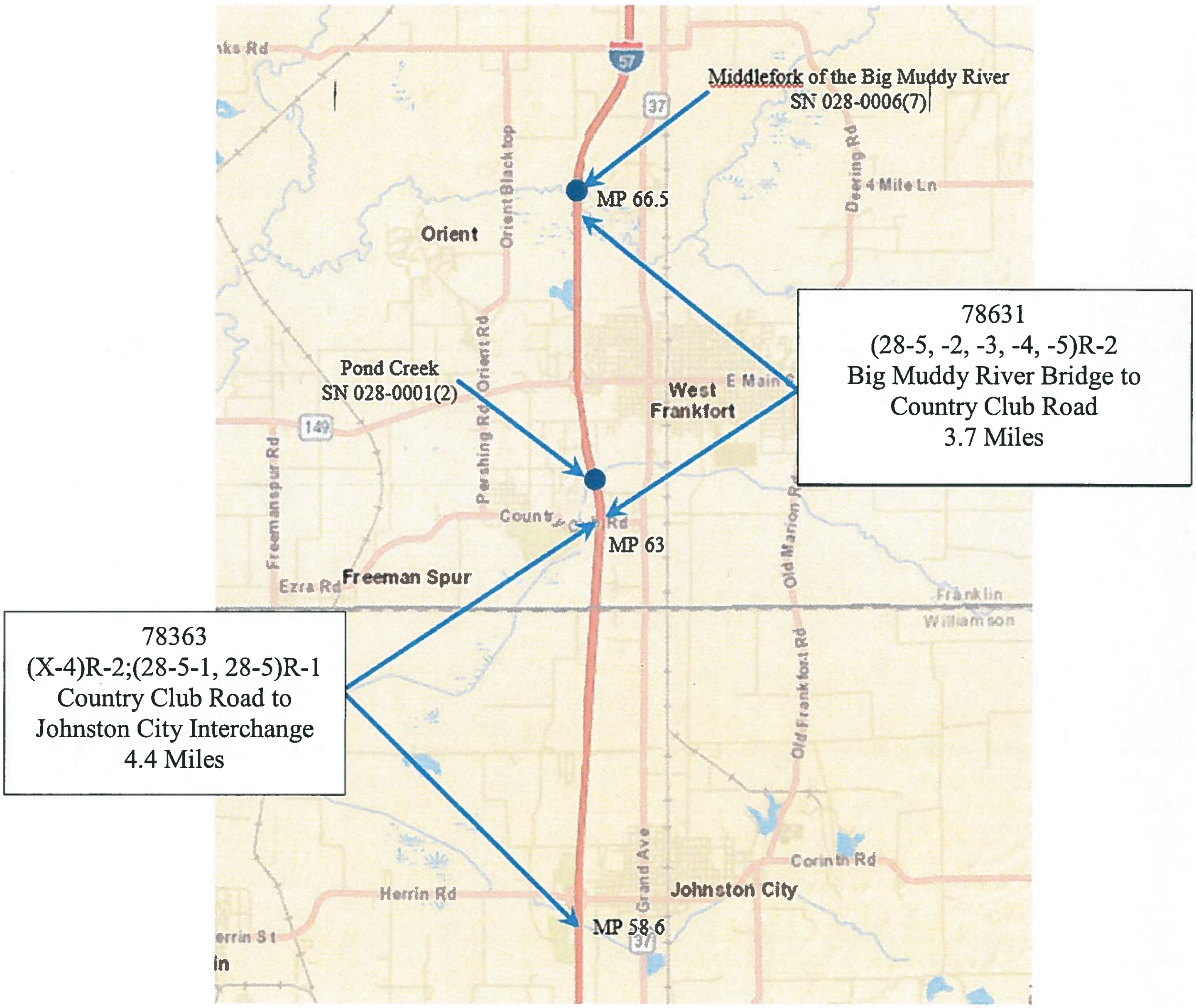
A 10” aggregate layer consisting of 5” of CA 7 or CA 11 topped with a 5” layer of CA 6 or CA 10 will be provided to facilitate drainage of the new pavement and the adjacent rubblized pavement.

The pavement designs, first cost worksheets, first cost comparison, location map, and traffic projections are included for your information and use.

Your quick approval would be greatly appreciated since the project has a PS&E date of August 17, 2018.  Any questions can be directed to Charles Stein at 618-351-5210.

# I-57 Add Lane Project

## Williamson & Franklin Counties



# TRAFFIC DATA FOR DESIGN

**COUNTY :** 100-WILLIAMSON/ 028-FRANKLIN **CITY:** N/A

COUNT YR. 2015 CONST. YR. 2018 K-FACTOR: 0.09

**LEG A:** **FAI 57 STA 11.83-15.59**

MARION TO JOHNSTON CITY MP 54 TO MP 59

EX. FAC.: 1.50%

| | 2015 | 2018 | 2028 | 2038 |
|---|---|---|---|---|
| | | 1.046 | 1.214 | 1.408 |
| P.V.s | 30,300 | 31,685 | 36,770 | 42,675 |
| S.U.s | 1,400 | 1,465 | 1,700 | 1,970 |
| M.U.s | 8,800 | 9,200 | 10,680 | 12,395 |
| ADT | 40,500 | 42,350 | 49,150 | 57,040 |
| DHV | 3,645 | 3,810 | 4,425 | 5,135 |

**LEG B:** **FAI 57 STA 15-59-18.64 (100) 0.00-2.50 (028)**

JOHNSTON CITY TO WEST FRANFORT MP 59 TO MP 65

EX. FAC.: 1.50%

| | 2015 | 2018 | 2028 | 2038 |
|---|---|---|---|---|
| | | 1.046 | 1.214 | 1.408 |
| P.V.s | 27,400 | 28,655 | 33,250 | 38,590 |
| S.U.s | 1,600 | 1,675 | 1,940 | 2,255 |
| M.U.s | 10,300 | 10,770 | 12,500 | 14,505 |
| ADT | 39,300 | 41,100 | 47,690 | 55,350 |
| DHV | 3,535 | 3,700 | 4,290 | 4,980 |

**LEG C:**

EX. FAC.:

| | 2015 | 2018 | 2028 | 2038 |
|---|---|---|---|---|
| | | 1.000 | 1.000 | 1.000 |
| P.V.s | - | - | - | - |
| S.U.s | | - | - | - |
| M.U.s | | - | - | - |
| ADT | | - | - | - |
| DHV | - | - | - | - |

**LEG D:**

EX. FAC.:

| | 2015 | 2018 | 2028 | 2038 |
|---|---|---|---|---|
| | | 1.000 | 1.000 | 1.000 |
| P.V.s | - | - | 0 | 0 |
| S.U.s | | - | 0 | 0 |
| M.U.s | | - | 0 | 0 |
| ADT | | - | - | - |
| DHV | 0 | 0 | - | - |

# MECHANISTIC PAVEMENT DESIGN

DETERMINE PAVEMENT THICKNESS FOR MEDIAN PASSING LANE

SINCE THE DISTRIBUTION FACTORS FOR THE DRIVING LANE FOR A 6 LANE FACILITY ARE

P = 20%

S = 40%

m = 40%

THE REMAINING TRAFFIC IS DISTRIBUTED EQUALLY ACROSS THE MIDDLE TWO LANES

P = 50% - 20% = 30%

S = 50% - 40% = 10%

m = 50% - 40% = 10%

10 YEAR TRAFFIC IS (2028)

PV = 36,770

SU = 1,700

MU = 10,680

$$TF = DP\left[\frac{(0.15 \cdot P \cdot PV) + (132.5 \cdot S \cdot SU) + (482.53 \cdot M \cdot MU)}{1 \times 10^6}\right]$$

$$TF = 20\left[\frac{(0.15 \times 0.30 \times 36770) + (132.5 \times 0.10 \times 1700) + (482.53 \times 0.10 \times 10680)}{1 \times 10^6}\right]$$

$$TF = 20\left[\frac{1654.65 + 22525 + 515342.04}{1 \times 10^6}\right]$$

$$TF = 10.79$$

SSR = POOR

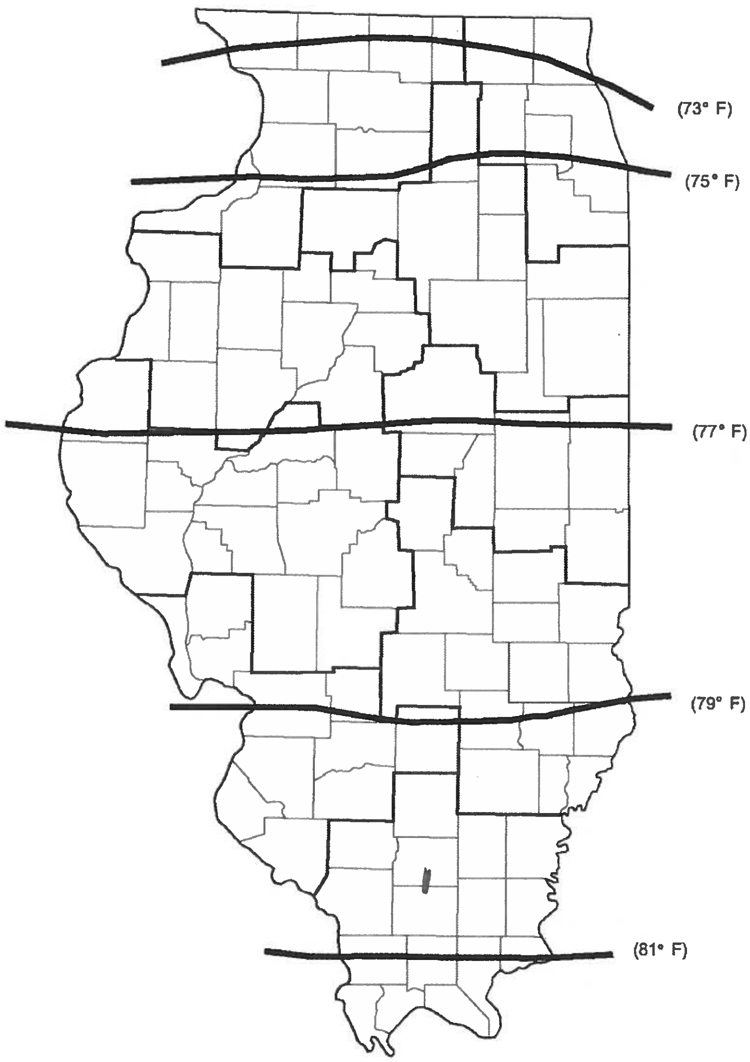
ASPHALT BINDER GRADE = 64-22

HMA MIX TEMPERATURE = 80°

HMA MIX MODULUS ($E_{HMA}$) = 560 KSI

HMA STRAIN = 61

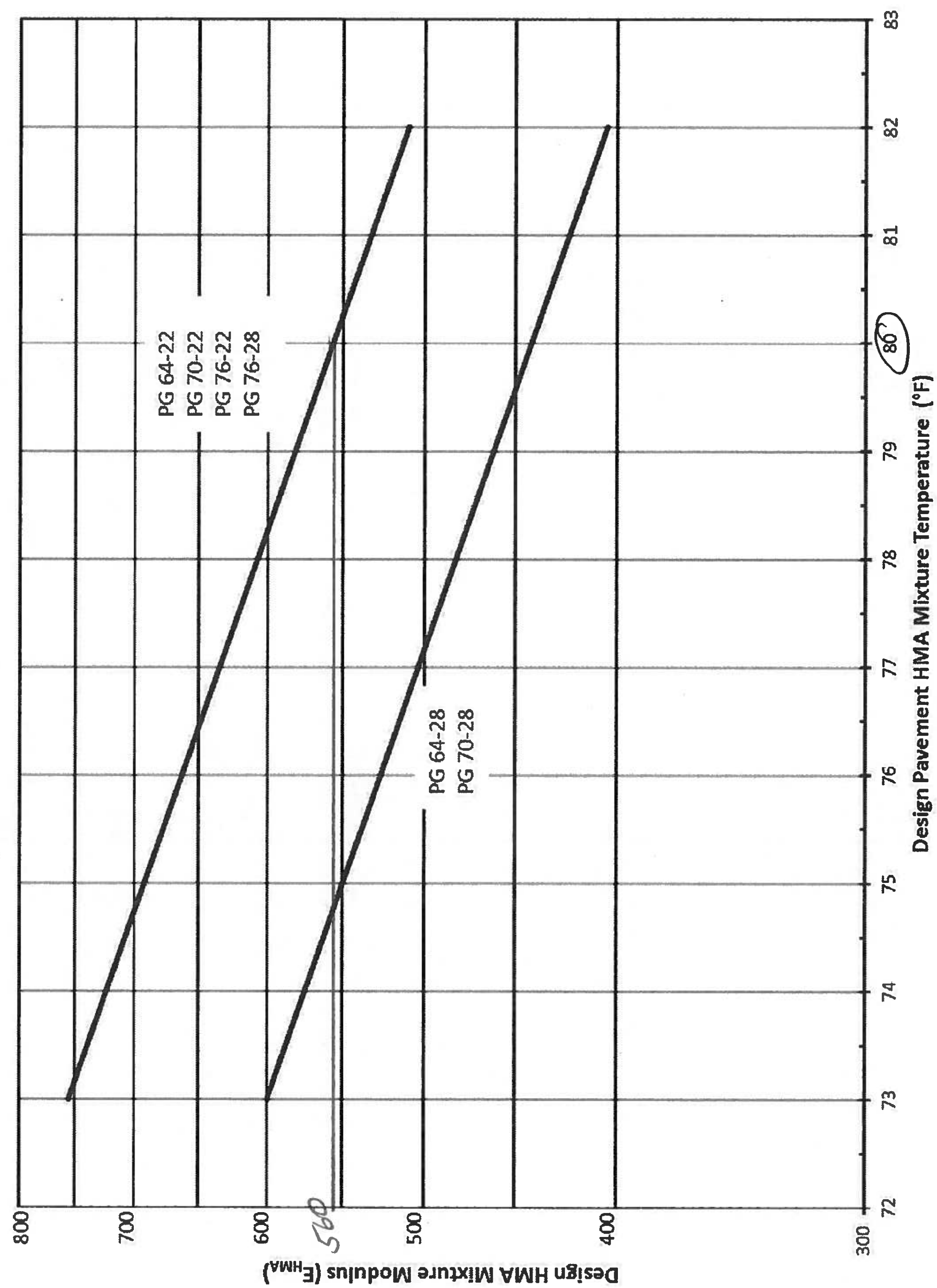
HMA THICKNESS = 13.8" USE 14"




*Note: The minimum design HMA mixture temperature will be 73°F.*

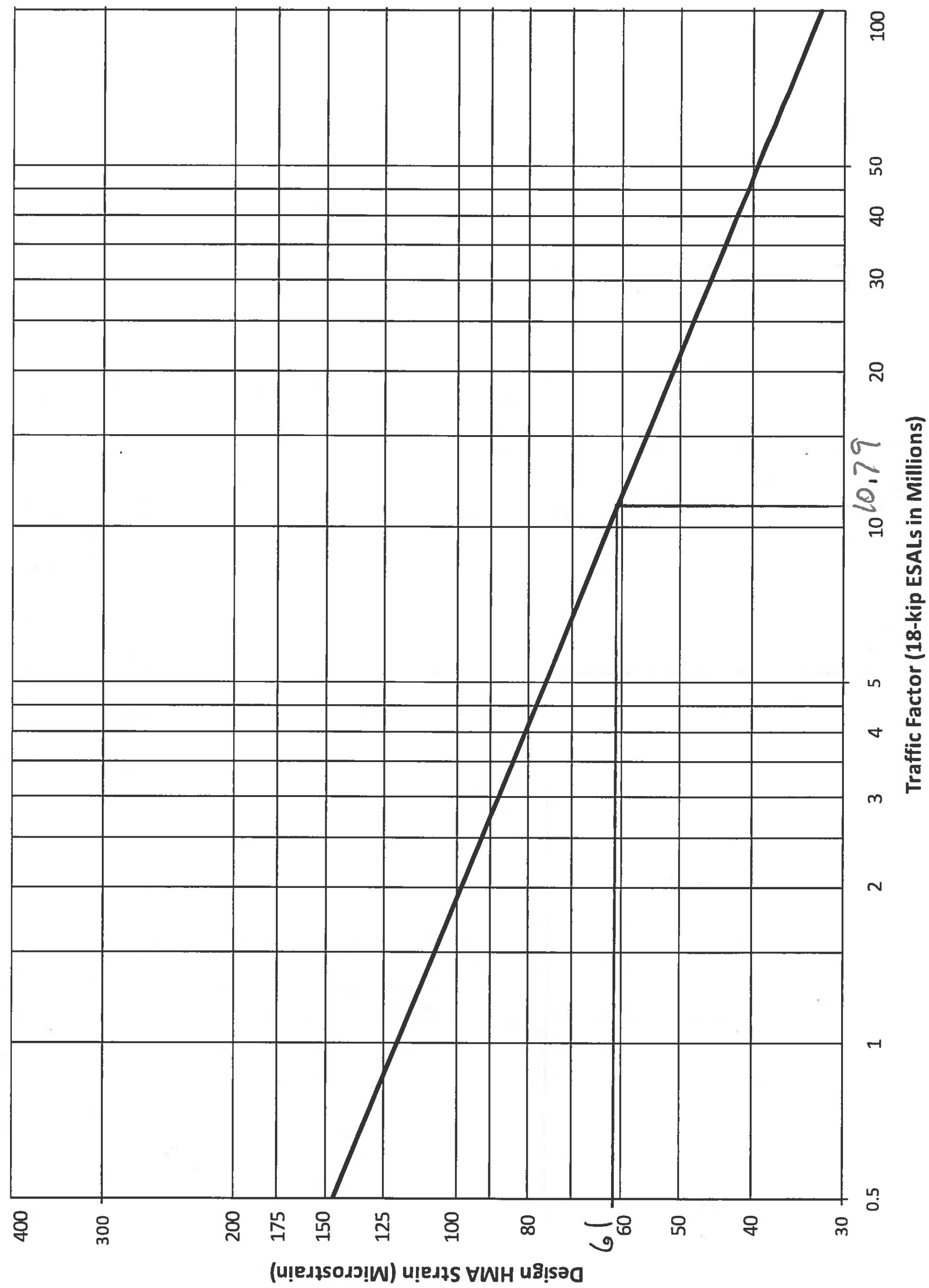
**HMA MIXTURE TEMPERATURE**
**(Mechanistic Design: Flexible Pavement)**

**Figure 54-5.C**



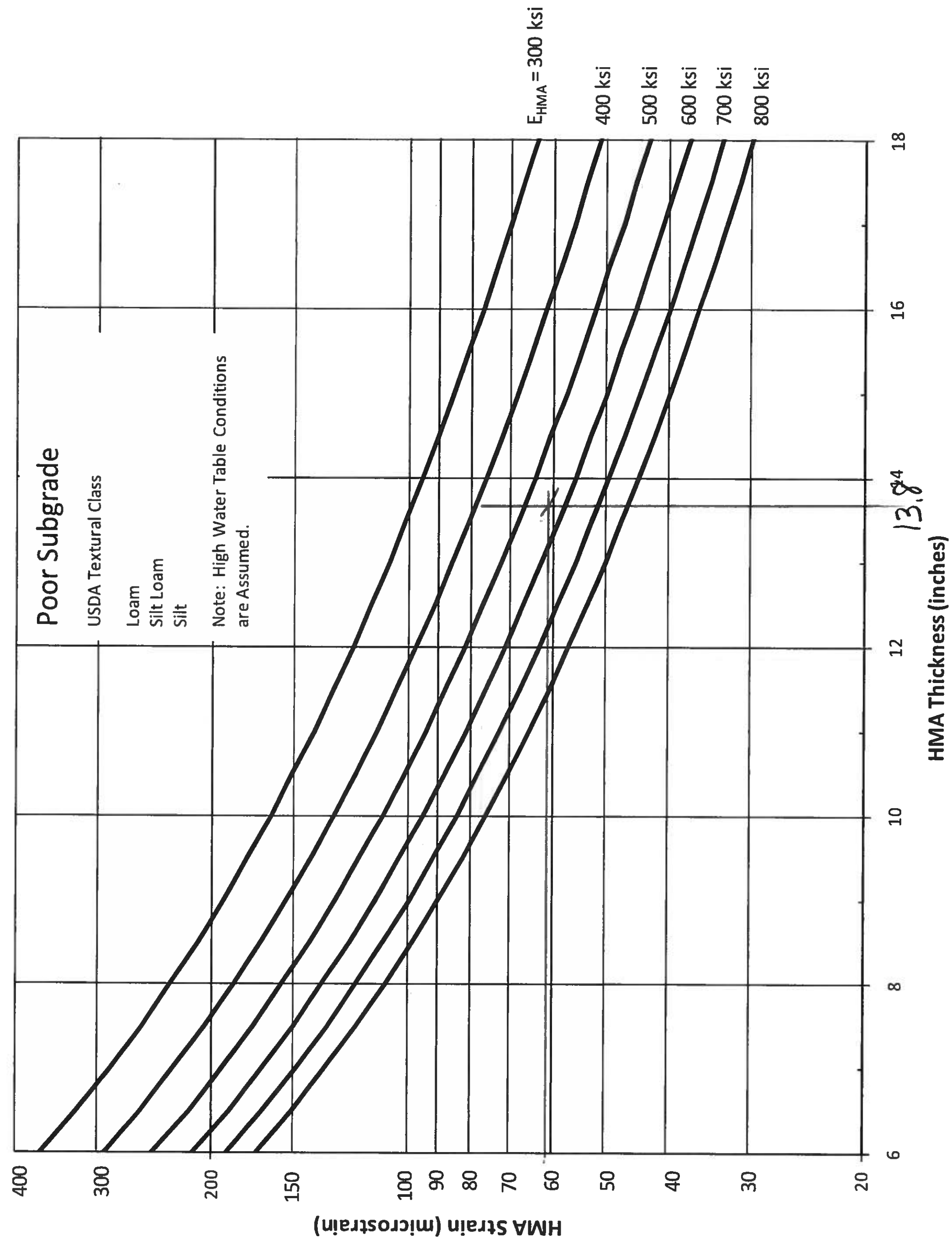

**HMA MIXTURE MODULUS ($E_{HMA}$)**
**(Mechanistic Design: Flexible Pavement)**

**Figure 54-5.D**




**DESIGN HMA STRAIN**
**(Mechanistic Design: Flexible Pavement)**

**Figure 54-5.E**




**HMA THICKNESS DESIGN CHART**
**(Mechanistic Design: Flexible Pavement: SSR = Poor)**

**Figure 54-5.F**

# Modified AASHTO Design

① Determine Traffic Factor

Class I - Interstate and Freeways

10 Year Traffic (2028)

PV = 36,770

SU = 1700

MU = 10,680

6 Lane Facility

$P = 20\%$
$S = 40\%$
$M = 40\%$

Traffic is Distributed Equally

$P = 50\% - 20\% = 30\%$
$S = 50\% - 40\% = 10\%$
$M = 50\% - 40\% = 10\%$

DP = 20 Years

$$TF = DP\left[\frac{(0.15 \cdot P \cdot PV) + (132.5 \cdot S \cdot SU) + (482.53 \cdot M \cdot MU)}{1 \times 10^6}\right]$$

$$TF = 20\left[\frac{(0.15 \cdot .3 \cdot 36770) + (132.5 \cdot .1 \cdot 1700) + (482.53 \cdot .1 \cdot 6680)}{1 \times 10^6}\right]$$

$TF = 10.79$

② Determine IBR

A-7-6 IBR - 2 (Franklin County)

A - 4 IBR - 3 (Williamson County)

③ Determine Structural Number (SNF)

IBR 2 ⇒ SNF 6.50

IBR 3 ⇒ SNF 5.92

# Modified AASHTO Design

④ Determine Types and Thicknesses of Materials

Figure 54-5.P  $a_1 = 0.42$

Figure 54-5.Q  $a_2 = 0.35$

Figure 54-5.O  $a_3 = 0.14$

$D_1 = 2$ inches

$D_3 = 10$ inches

$SN_F = 6.50$ (Franklin County)

$SN_F = 5.92$ (Williamson County)

$$D_2 = \frac{SN_F - a_1 D_1 - a_3 D_3}{a_2}$$

$$D_2 = \frac{6.50 - 0.42(2) - 0.14(10)}{0.35} = 12.17 \text{ inches}$$

$$D_2 = \frac{5.92 - 0.42(2) - 0.14(10)}{0.35} = 10.52 \text{ inches}$$

$D_2 = 12.25$ inches (Franklin County)

$D_2 = 10.75$ inches (Williamson County)

⑤ Compare with Minimum Criteria

| | | | |
|---|---|---|---|
| $SN_F = 6.50$ | Surface | 1.5" | HMA (4% Voids) |
| | Base | 12" | Stabilized Granular Material |
| | Subbase | 4" | Granular Material, Type A |
| $SN_F = 5.92$ | Surface | 1.5" | HMA (4% Voids) |
| | Base | 10" | Stabilized Granular Material |
| | Subbase | 4" | Granular Material, Type A |

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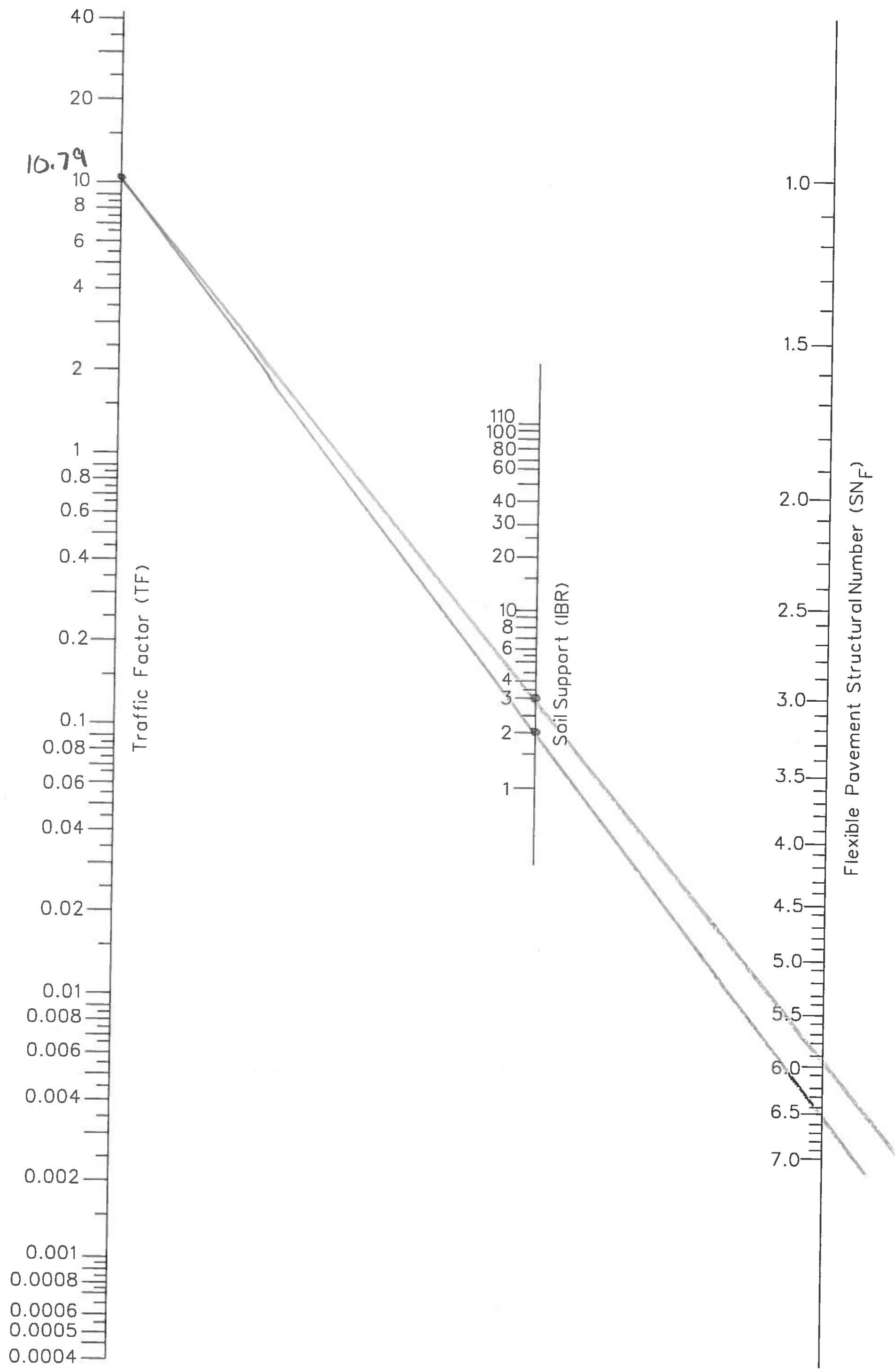
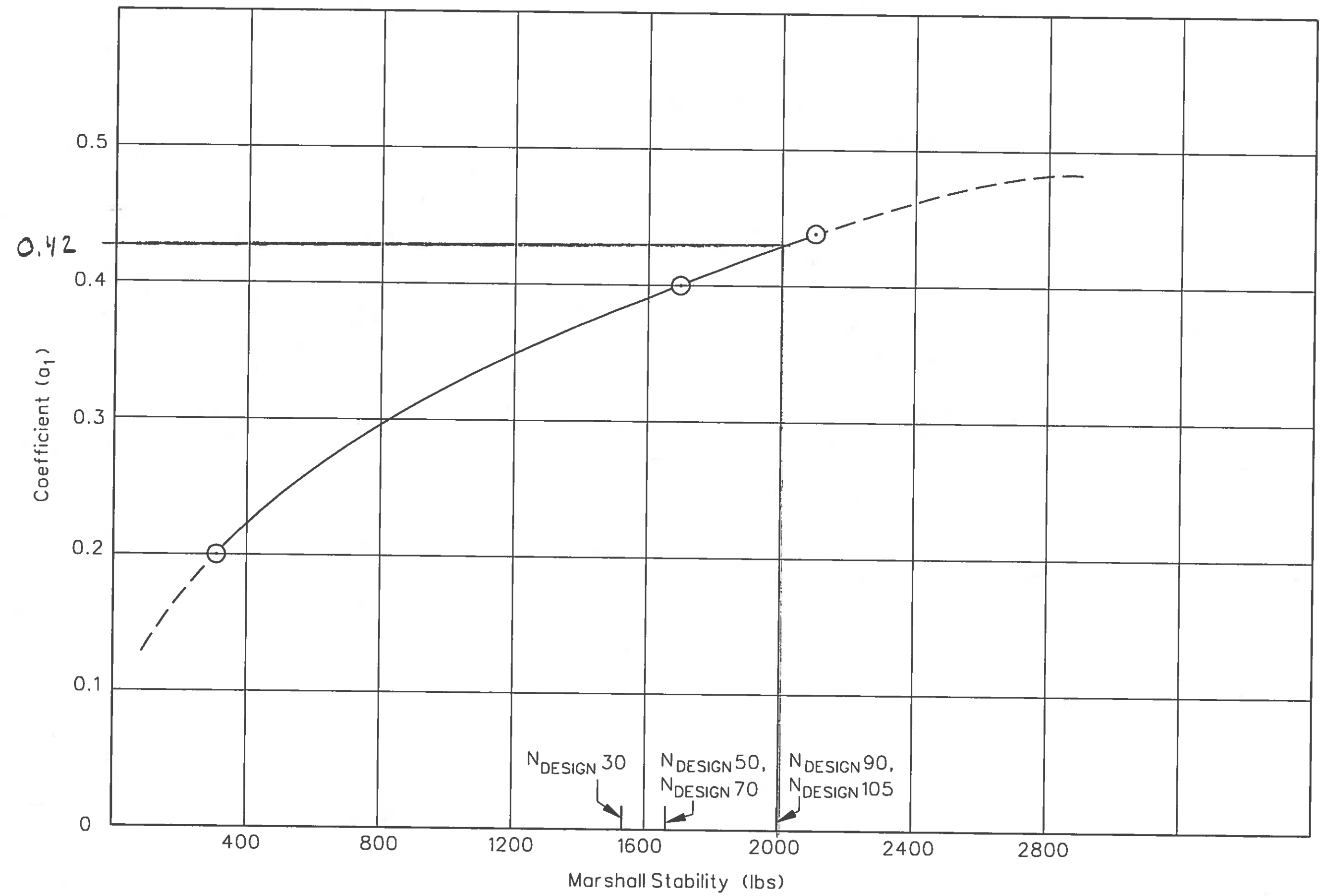



**FLEXIBLE PAVEMENT DESIGN NOMOGRAPH**
**(Modified AASHTO Design: Class I Facilities)**

**Figure 54-5.M**

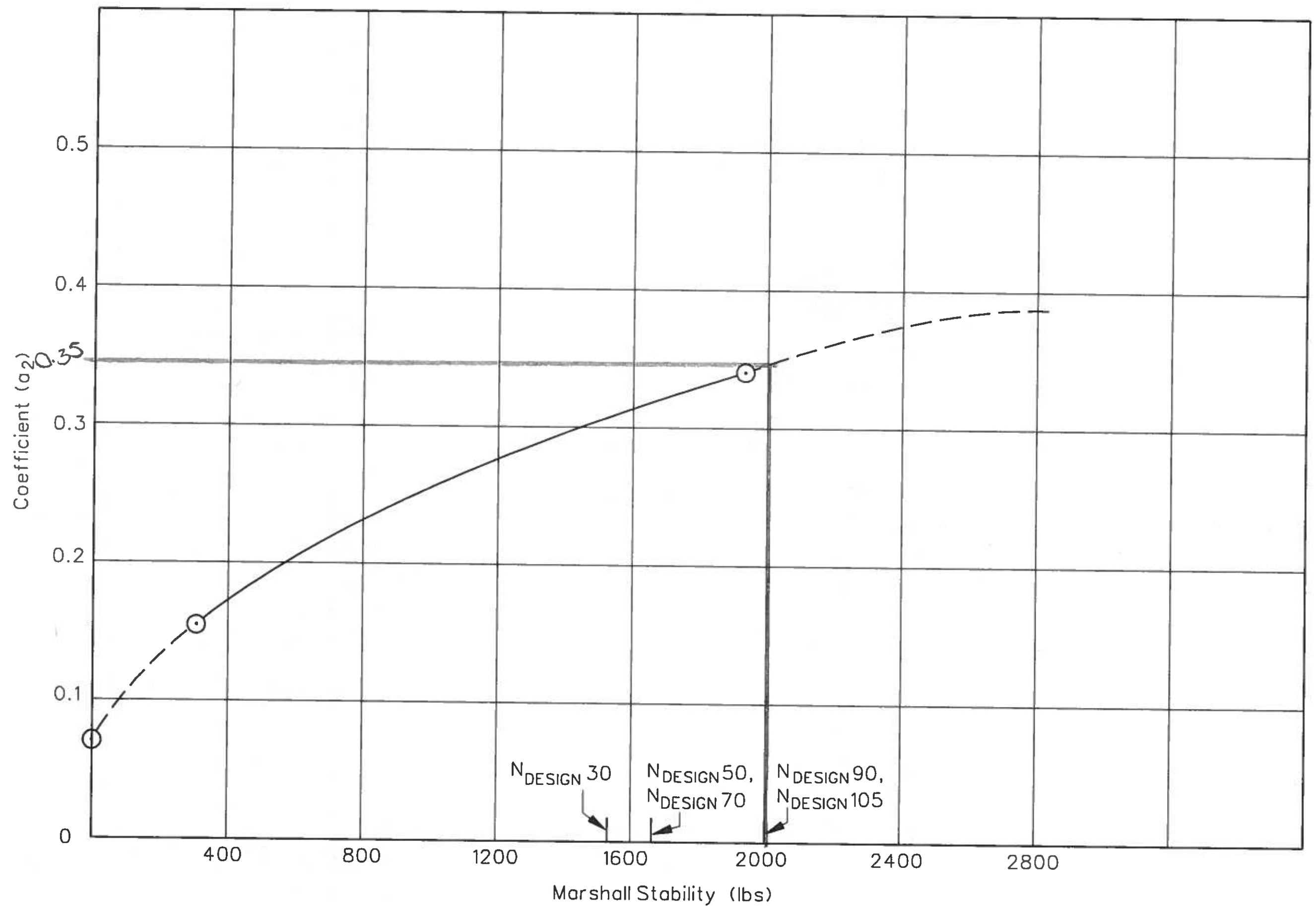



*Note. The following Marshall stabilities can be assumed:*

- *1,500 lb for HMA $N_{Design}$30 mixes,*
- *1,700 lb for HMA $N_{Design}$50 and $N_{Design}$70 mixes, and*
- *2,000 lb for HMA $N_{Design}$90 and $N_{Design}$105 mixes.*

**COEFFICIENTS FOR HMA SURFACE COURSE MATERIALS**
**(Modified AASHTO Design)**

**Figure 54-5.P**




*Note. The following Marshall stabilities can be assumed:*

- *1500 lb for HMA $N_{Design}$30 mixes,*
- *1700 lb for HMA $N_{Design}$50 and $N_{Design}$ 70 mixes, and*
- *2000 lb for HMA $N_{Design}$ 90 and $N_{Design}$ 105 mixes.*

**COEFFICIENTS FOR HMA STABILIZED GRANULAR MATERIALS**
**(Modified AASHTO Design)**

**Figure 54-5.Q**

6 of 7



| STRUCTURAL MATERIALS | MINIMUM STRENGTH REQUIREMENTS | | | COEFFICIENTS ③ | | |
|---|---|---|---|---|---|---|
| | MS ① | IBR | CS ② | $a_1$ | $a_2$ | $a_3$ |
| **HMA Surface** | | | | | | |
| Road Mix (Class B) | | | | 0.20 | | |
| Plant Mix (Class B) | | | | | | |
| Liquid Asphalt | | | | 0.22 | | |
| Asphalt Binder | 900 | | | 0.30 | | |
| HMA Surface Course (4% voids) | | | | 0.40 | | |
| **Base Course** | | | | | | |
| Aggregate, Type B | | | | | | |
| Uncrushed | | 50 | | | 0.10 | |
| Crushed | | 80 | | | 0.13 | |
| Aggregate, Type A | | 80 | | | 0.13 | |
| Waterbound Macadam | | 110 | | | 0.14 | |
| Bituminous Stabilized Granular Material | 300 | | | | 0.16 | |
| | 400 | | | | 0.18 | |
| | 800 | | | | 0.23 | |
| | 1,000 | | | | 0.25 | |
| | 1,200 | | | | 0.27 | |
| | 1,500 | | | | 0.30 | |
| | 1,700 | | | | 0.33 | |
| HMA Binder Course (4% voids) | | | | | 0.33 | |
| Pozzolanic, Type A | | | 600 | | 0.28 | |
| Lime Stabilized Soil | | | 150 | | 0.11 | |
| Select Soil Stabilized | | | 300 | | 0.15 | |
| with Cement | | | 500 | | 0.20 | |
| Cement Stabilized Granular Material | | | 650 | | 0.23 | |
| | | | 750 | | 0.25 | |
| | | | 1,000 | | 0.28 | |
| **Subbase** | | | | | | |
| Granular Material, Type B | | 30 | | | | 0.11 |
| Granular Material, Type A | | | | | | |
| Uncrushed | | 50 | | | | 0.12 |
| Crushed | | 80 | | | | 0.14 |
| Lime Stabilized Soil | | | 100 | | | 0.12 |

*Notes:*

① *Marshall Stability (MS) index or equivalent.*

② *Compressive strength (CS) in pounds per square inch (psi). For cement stabilized soils and granular materials, use the 7-day compressive strength that can be reasonably expected under field conditions. For lime stabilized soils, use the accelerated curing compressive strength at 120°F for 48 hours. For Pozzolanic, Type A, use the compressive strength after a 14-day curing period at 72°F.*

③ *For materials with strengths other than those shown, the coefficients may be determined from Figures 54-5.P, 54-5.Q, and 54-5.R. Other approved materials of similar strengths may be substituted for those presented in Figure 54-5.O.*

**COEFFICIENTS FOR MATERIALS IN NEW FLEXIBLE PAVEMENT STRUCTURES (Modified AASHTO Design)**

**Figure 54-5.O**

| STRUCTURAL NUMBER ($D_t$) ① | | MINIMUM THICKNESS (inches) | | | MINIMUM MATERIAL ⑤ | | |
|---|---|---|---|---|---|---|---|
| From | To | Surface | Base ② | Subbase ③ (optional) | Surface | Base ⑥ | Subbase ⑧ (optional) |
| 1.00 | 1.99 | 2 | 8 | 4 ④ | Class B Road Mix | Aggregate, Type B ⑦ | Granular Material, Type B ④ |
| | | | 6 | | | Stabilized Granular Material ($MS_{min}$ = 300 or $CS_{min}$ = 300) | |
| 2.00 | 2.49 | 2 | 8 | 4 ④ | Class B Plant Mix (asphalt binder) | Aggregate, Type B ⑦ | Granular Material, Type B ④ |
| | | | 6 | | | Stabilized Granular Material ($MS_{min}$ = 300 or $CS_{min}$ = 300) | |
| 2.50 | 2.99 | ⑨ | 9 | 4 | Class B Plant Mix (asphalt binder) | Aggregate, Type A | Granular Material, Type B |
| | | | 7 | | | Stabilized Granular Material ($MS_{min}$ = 300 or $CS_{min}$ = 300) | |
| 3.00 | 3.49 | ⑨ | 11 | 4 | HMA (4% voids) | Aggregate, Type A | Granular Material, Type B |
| | | | 8 | | | Stabilized Granular Material ($MS_{min}$ = 400 or $CS_{min}$ = 400) | |
| 3.50 | 3.99 | ⑨ | 8 | 4 | HMA (4% voids) | Stabilized Granular Material ($MS_{min}$ = 800 or $CS_{min}$ = 650) | Granular Material, Type B |
| 4.00 | 4.49 | ⑨ | 8 | 4 | HMA (4% voids) | Stabilized Granular Material ($MS_{min}$ = 1,000 or $CS_{min}$ = 750) | Granular Material, Type B |
| 4.50 | 4.99 | ⑨ | 9 | 4 | HMA (4% voids) | Stabilized Granular Material ($MS_{min}$ = 1,200 or $CS_{min}$ = 1,000) | Granular Material, Type B |
| | | | 9 | | | Pozzolanic, Type A | |
| 5.00 | 5.99 | ⑨ | 10 | 4 | HMA (4% voids) | Stabilized Granular Material ($MS_{min}$ = 1,500) | Granular Material, Type A |
| ≥ 6.00 | | ⑨ | 12 | 4 | HMA (4% voids) | Stabilized Granular Material ($MS_{min}$ = 1,700) | Granular Material, Type A |

*Notes:*

① *The minimum allowable structural number for Interstates and freeways will be 5.6; for multi-lane State primary highways, 5.0; and for two-lane State primary highways, 4.0.*
② *Where bituminous stabilized granular material with a strength greater than the minimum required above is used, a reduction in the minimum required thickness, up to a maximum of 1 in., will be allowed.*
③ *The minimum thickness of a lime stabilized soil subbase will be 6 in.*
④ *If an uncrushed Aggregate Base Course, Type B is used, a subbase will not be used.*
⑤ *Other approved materials having equal or greater strengths may be substituted for those listed above.*
⑥ *MS = Marshall Stability (lb) or equivalent, CS = 7-day compressive strength (psi) that can be reasonably expected under field conditions.*
⑦ *Lime stabilized soil may be used, provided the minimum thickness is not less than 8 in.*
⑧ *The use of a granular subbase is not mandatory.*
⑨ *Use Policy Resurfacing Thickness (see Chapter 53), unless prior BDE approval is received.*

**MINIMUM THICKNESS AND MATERIAL REQUIREMENTS FOR FLEXIBLE PAVEMENTS**
**(Modified AASHTO Design)**
**Figure 54-5.S**

# Composite Pavement Design

① Determine Traffic Factor

Class I - Interstate and Freeways

10 Year Traffic (2028)

PV = 36,770

Su = 1700

Mu = 10,680

6 Lane Facility — Traffic is Distributed Equally

$$\left.\begin{array}{l} P = 20\% \\ S = 40\% \\ M = 40\% \end{array}\right\} \quad \begin{array}{l} P = 50\% - 20\% = 30\% \\ S = 50\% - 40\% = 10\% \\ M = 50\% - 40\% = 10\% \end{array}$$

DP = 20 Years

$$TF = DP\left[\frac{(0.15 \cdot P \cdot PV) + (143.81 \cdot S \cdot Su) + (696.42 \cdot M \cdot Mu)}{1\times10^6}\right]$$

$$TF = 20\left[\frac{(0.15 \cdot .3 \cdot 36{,}770) + (143.81 \cdot .1 \cdot 1700) + (696.42 \cdot .1 \cdot 10{,}680)}{1\times10^6}\right]$$

$TF = 15.398$

② Determine IBR

A-7-6 IBR - 2 (Franklin County)

A-4 IBR - 3 (Williamson County)

③ Determine Structural Number ($SN_c$)

IBR 2 => $SN_c$ 4.62

IBR 3 => $SN_c$ 4.55

# Composite Pavement Design

4 Determine Thickness

$SN_c = 4.62$ (Franklin County)

$SN_c = 4.55$ (Williamson County)

$D_S = 2$ inches

$$D_B = \frac{SN_c - 0.40 D_S}{0.33}$$

$$D_B = \frac{4.62 - 0.40(2)}{0.33} = 11.58 \text{ inches}$$

$$D_B = \frac{4.55 - 0.40(2)}{0.33} = 11.36 \text{ inches}$$

Use $D_B = 12.0''$ Thickness of new PCC Base Course

5 Compare with Minimum Criteria

Class I - 8 inches minimum

| Soil Classification | IBR |
|---|---|
| A-1 | 20 |
| A-2-4, A-2-5 | 15 |
| A-2-6, A-2-7 | 12 |
| A-3 | 10 |
| A-4, A-5, A-6 | 3 |
| A-7-5, A-7-6 | 2 |

**SUGGESTED IBR VALUES FOR VARIOUS SOIL CLASSIFICATIONS**

**Figure 54-3.A**

Pavement performance is directly related to the physical properties and the support capacity of the materials used in the pavement structure and of the roadbed soils. The effect of less satisfactory soils, to some degree, can be reduced by increasing the thickness of the pavement structure, but it may be necessary to take other steps to ensure adequate pavement performance. The problems that can be encountered because roadbed soils are subject to permanent deformation, excessive volume changes, excessive deflection and rebound, frost susceptibility, and non-uniform support from wide variations in soil types within the State should be recognized in the design stage. Corrective measures should be included in the plans and in the special provisions for any and all small isolated areas of unsatisfactory soils. If such areas contain soils that are unsatisfactory for roadbed construction, the soils should be either removed and replaced with satisfactory soils or granular material or improved in-place with a suitable stabilizing agent. If such soils are unsatisfactory only from the standpoint of having an IBR less than the minimum selected for design, consider the following treatments:

- remove and replace with soils or granular material at or above the minimum value,
- remove and replace with additional subbase material to a depth that will compensate for the deficiency in support strength, or
- improve the material in-place with a suitable stabilizing agent.

See the IDOT *Subgrade Stability Manual* for further guidance.

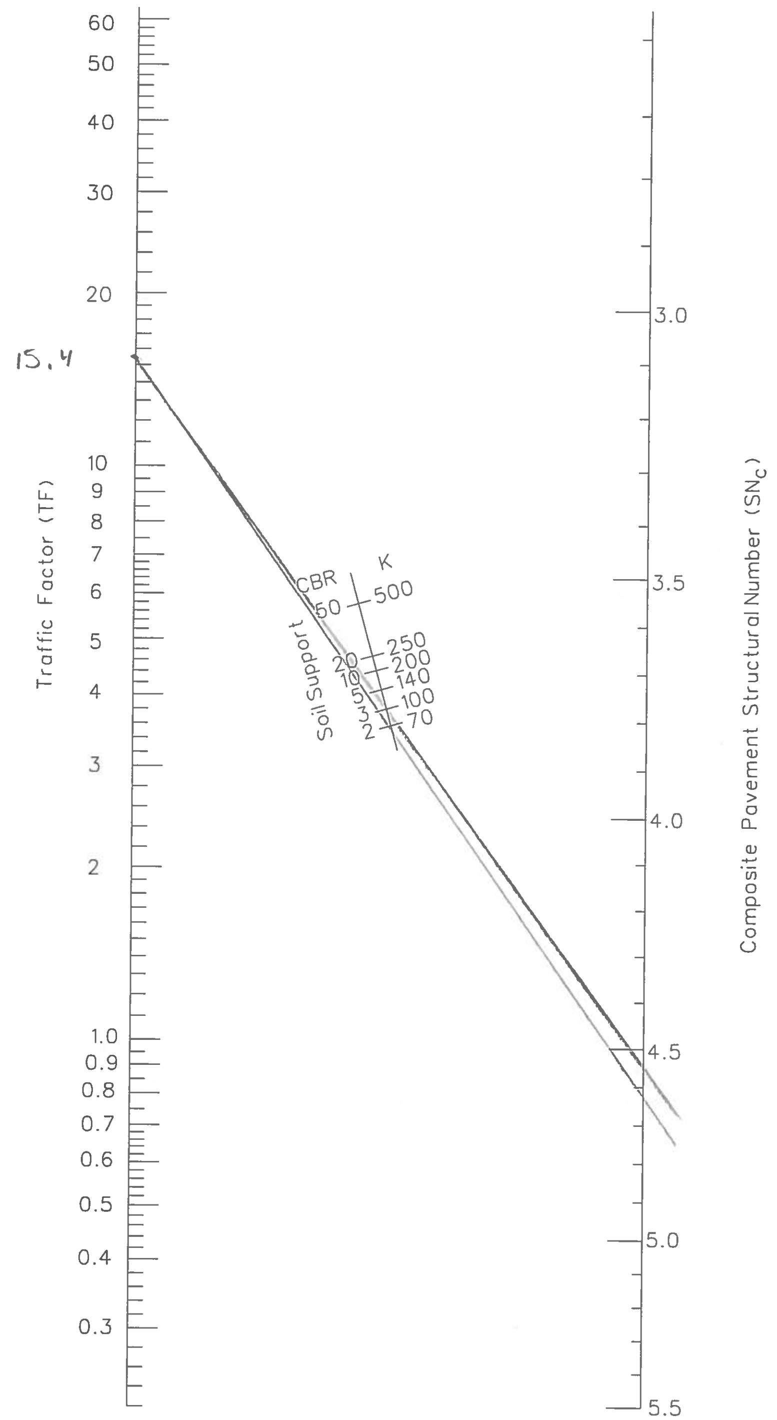
### 54-3.02 Structural Design

Section 54-2.02 applies to the modified AASHTO design procedures.

### 54-3.03 Limitations and Requirements

#### 54-3.03(a) General

Section 54-2.03(a) applies to the modified AASHTO design procedures.




**COMPOSITE PAVEMENT DESIGN NOMOGRAPH**
**(Class I Facilities)**

**Figure 54-6.A**

3. New Composite Pavement. For the design of a new composite pavement, use the following equation:

$$SN_C = 0.40\ D_S + 0.33\ D_B \qquad \text{Equation 54-6.3}$$

where:

$SN_C$ = composite pavement structural number
$D_S$ = thickness of HMA policy overlay (inches)
$D_C$ = equivalent thickness of existing PCC slab (inches)
$D_E$ = thickness of existing HMA surface (inches)
$D_B$ = thickness of new PCC base course (inches)

Note that the above equations do not include provisions for a third resurfacing. Pavements that are in need of a third resurfacing for structural reasons often are badly deteriorated and may no longer be functioning as a rigid pavement. Contact BDE or the Bureau of Research for guidance in selecting the appropriate strength coefficients for such pavements.

In the case of an existing JRCP/JPCP of uniform thickness, the equivalent thickness of the PCC slab ($D_C$) is the actual slab thickness. For a CRCP, $D_C$ is the slab thickness multiplied by 1.25. Figure 54-6.C presents the equivalent thickness ($D_C$) of the non-uniform PCC pavements formerly constructed by the Department.

Use Equation 54-6.3 to develop designs for totally new composite pavements composed of an HMA surface and a PCC base course. The application of this pavement design procedure is restricted as follows:

- to changes in horizontal or vertical alignment for short segments of rural pavement,
- to lane additions,
- to reconstruction of short segments of urban pavement, and
- as an option to flexible base materials.

Equation 54-6.3 requires determination of two unknowns (i.e., the surface and the base course thicknesses). To develop a design, it becomes necessary, therefore, to assume the thickness of one pavement component and compute the required thickness of the other. In most cases, it will be best to initially assume the surface course thickness. The surface course thickness selected should be the standard policy resurfacing thickness or the thickness of the resurfacing being placed on the adjacent pavement.

## 54-6.07 Minimum Design Requirements

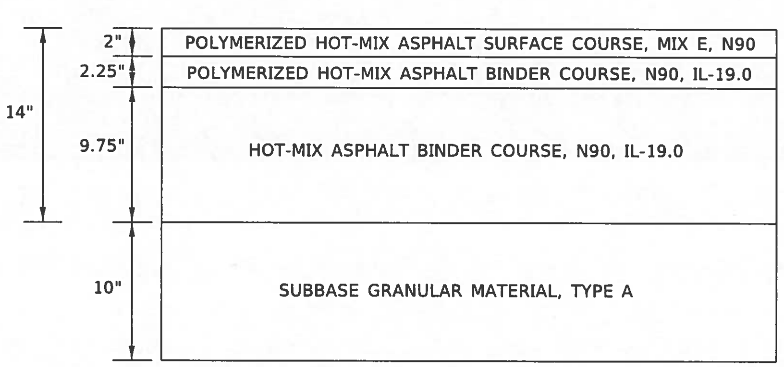
The composite design procedures are used to analyze PCC slabs that are surfaced with high-type HMA and are therefore limited to HMA surfacing materials that meet the requirements of the *Standard Specifications* for HMA. To ensure practical and adequate designs, adhere to the minimum criteria presented in Figure 54-6.D for composite pavements.

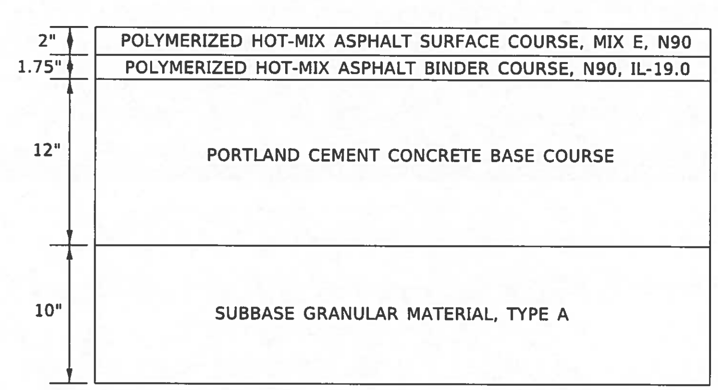
| Pay Item Number | Pay Item | Unit | Mechanistic Design: Full-Depth HMA | | | Composite Pavement Design | | | Modified AASHTO Design | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Quantity/Mile | Unit Cost | Cost | Quantity/Mile | Unit Cost | Cost | Quantity/Mile | Unit Cost | Cost |
| 31100900 | Subbase Granular Material, Type A, 10" | SQ YD | 14080 | 16.49 | $232,179.20 | 14080 | 16.49 | $232,179.20 | 14080 | 16.49 | $232,179.20 |
| 35300700 | Portland Cement Concrete Base Course, 12" | SQ YD | 0 | | $0.00 | 14080 | 54.52 | $767,641.60 | 0 | | $0.00 |
| 40603090 | Hot-Mix Asphalt Binder Course, IL-19.0, N90 | TON | 0 | | $0.00 | 0 | | $0.00 | 7884.8 | 72.39 | $570,780.67 |
| 40603240 | Polymerized Hot-Mix Asphalt Binder Course, IL-19.0, N90 | TON | 0 | | $0.00 | 1379.84 | 81.1 | $111,905.02 | 1774.08 | 81.1 | $143,877.89 |
| 40603570 | Polymerized Hot-Mix Asphalt Surface Course, Mix "E", N90 | TON | 0 | | $0.00 | 1576.96 | 98.01 | $154,557.85 | 1576.96 | 98.01 | $154,557.85 |
| 40701961 | Hot-Mix Asphalt Pavement (Full-Depth), 14" | SQ YD | 14080 | 61.38 | $864,230.40 | 0 | | $0.00 | 0 | | $0.00 |
| | | **Total Cost** | | | **$1,096,409.60** | | | **$1,266,283.67** | | | **$1,101,395.61** |

| Pay Item Number | Pay Item | Unit | Mechanistic Design: Full-Depth HMA | | | Composite Pavement Design | | | Modified AASHTO Design | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Quantity/8 Mile | Unit Cost | Cost | Quantity/8 Mile | Unit Cost | Cost | Quantity/8 Mile | Unit Cost | Cost |
| 31100900 | Subbase Granular Material, Type A, 10" | SQ YD | 112640 | 16.49 | $1,857,433.60 | 112640 | 16.49 | $1,857,433.60 | 112640 | 16.49 | $1,857,433.60 |
| 35300700 | Portland Cement Concrete Base Course, 12" | SQ YD | 0 | | $0.00 | 112640 | 54.52 | $6,141,132.80 | 0 | | $0.00 |
| 40603090 | Hot-Mix Asphalt Binder Course, IL-19.0, N90 | TON | 0 | | $0.00 | 0 | 0 | $0.00 | 63078.4 | 72.39 | $4,566,245.38 |
| 40603240 | Polymerized Hot-Mix Asphalt Binder Course, IL-19.0, N90 | TON | 0 | | $0.00 | 11038.72 | 81.1 | $895,240.19 | 14192.64 | 81.1 | $1,151,023.10 |
| 40603570 | Polymerized Hot-Mix Asphalt Surface Course, Mix "E", N90 | TON | 0 | | $0.00 | 12615.68 | 98.01 | $1,236,462.80 | 12615.68 | 98.01 | $1,236,462.80 |
| 40701961 | Hot-Mix Asphalt Pavement (Full-Depth), 14" | SQ YD | 112640 | 61.38 | $6,913,843.20 | 0 | | $0.00 | 0 | | $0.00 |
| | | **Total Cost** | | | **$8,771,276.80** | | | **$10,130,269.39** | | | **$8,811,164.88** |

**MECHANISTIC DESIGN: FULL DEPTH HMA PAVEMENT**




**COMPOSITE PAVEMENT DESIGN**




**MODIFIED AASHTO DESIGN**